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ABSTRACT

This paper summarizes the results of a field study conducted by the Center for Research in Scientific Communication at the University of Minnesota, Saint Paul, which concerned the effects of a technology-monitoring program on communication activities, behaviors, and attitudes of employees at a multinational, Minneapolis-based company. It was hypothesized that the monitoring program itself would effect a significantly higher rate of innovative ideas and attitudes in subjects and generally reduce group resistance to innovation. In fact, 20 company managers who participated in the program reported more frequent communications, concerning innovation, with supervisors, coworkers, people in different units within the company, and individuals not employed by the company. Similarly, managers' self-reported increase in the reading of technical and professional journals was substantiated by their improved recognition of the titles of such materials. Participating managers also attended more seminars, workshops, and other forums where technical information was presented than did those managers not involved with the program. (KS)

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THE PROCESSES AND EFFECTS OF AN INTERNAL TECHNOLOGY DISCOVERY PROGRAM UPON MANAGEMENT

by

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CS 501 513

In both public and private research-oriented organizations, administrators are increasingly having to account for shifting lines of technical development and shifting priorities. Both are essential for the "competitive edge" in high-level technology and research and development. (Shriner, 1975)

To provide for greater amounts of lead time for responding to changes as well as discovering new and/or dormant forms of technology for possible application or licensing; companies and government agencies have used the format of technology assessment to enable high-level management to uncover, identify, isolate, and evaluate potential innovations for development and market analysis. (Control Data Corporation, 1976)

What may be of greater importance than assessing or "uncovering" technology is the potential of the technology assessment activity to provide the basis for innovation itself.

In a detailed study by the Battelle-Columbus Laboratories of ten innovations (involving actual cases including the cardiac pacemaker, hybrid grains, electrophotography, oral contraceptives, magnetic ferrites, and the video tape recorder), 21 factors were identified as being significant in each innovation. The most important factors were: "recognition of scientific opportunity" and "recognition of technical opportunity." (Globe, Levy, and Schwartz, 1974)

Both factors can be found in the monitoring or inventory stages of technology assessment. The "looking for" processes in a technology quest within an organization "increase the use of existing technical information and the recognition of demand and technical feasibility leading to

innovation." (Gruber and Marquis, 1969)

In a study for the German Management and Productivity Association also conducted by Battelle entitled, "Transforming Current Knowledge for the Purpose of Corporate Innovations," (Battelle, 1974), it is pointed out that:

- the importance of existing knowledge is often underestimated
- the exploitation of information is hampered by policies, regulations, and personal attitudes within the company (e.g. the flow of information is excessively formalized, and there is no interest or a lack of motivation on the part of staff members)

In an assessment of technology a great deal can happen. Ideas are shaped, put into words, visualized, and exposed and tested for both informal and formal review. An argument can be made that through the processes of assessing and monitoring internal technology, creation, diffusion, and infusion of ideas are the natural byproducts. Sherman Gee has explained that "a period of evaluating available knowledge and alternative methods to seek an economically and technically feasible means to realize an idea" is the first phase of innovation itself. (Gee, 1974)

With this theoretical framework, the Center for Research in Scientific Communication at the University of Minnesota is conducting a field study assessment of effects of an in-company technology monitoring inventory at a multi-national Minneapolis-based company.

Using the preceding studies as a backdrop, the technology monitoring incentive program is being viewed in the light of an holistic process involving the transforming of scientific and technical knowledge into industrial application and marketable goods and services.

Producing new knowledge, making existing knowledge available, dissemination of technical knowledge, reception and review of technical knowledge, and the application of technical knowledge all involve communication behaviors. (Battelle, 1974)

Therefore, the objectives of this study are focused upon the communication activities, behaviors, and attitudes of employees vis-a-vis innovation (the goal of technology monitoring generally and this incentive program specifically.)

The general hypothesis is that the company program was (in fact) a process for increasing specific communication activity, increasing innovative attitudes and behaviors and generally reducing individual and group resistance to innovation and the precursors to innovation.

Specifically, we will substantiate the hypothesis that the benefits in communication activity, innovative behavior, and attitudes and morale will transcend the original objectives. (Jasper, 1975)

The null hypothesis is that there will be no significant differences between groups and individuals who participated in the technology monitoring program and those who did not. Differences will be observed on responses to questions dealing with attitudes, self-reports of behavior, observations, and awarenesses.

A pilot study has been conducted with test instruments. The results of the pilot study have been analyzed, and final corrections have been made upon a questionnaire instrument that will be mailed to approximately 1000 randomly-selected stratified samples of the technology monitoring participants and non-participants.

Pilot Study

Using a questionnaire in a structured interview setting, twenty managers were selected as respondents to an instrument containing the following item-variables:

1. Level of management of respondent
2. Period of employment within company
3. Age of respondent
4. Sex of respondent
5. Frequency and origin of communication about innovations within company
6. Technical reading
7. Frequency of enrollment in continuing education
8. Frequency of participation in in-house training-learning situations
9. Frequency of origination of innovative proposals
10. Awareness of gatekeepers within organization
11. Perceived support for innovation within company
12. Satisfaction with higher management support for innovation.

Preliminary chi-square tests were run on the non-demographic data. The results of the pilot study indicate significant differences in the responses of managers who participated in the technology monitoring incentive program compared to those who did not. In item-variables 5, 6, 8, 9, 10, and 11 (above) differences in groups were computed at the .05 level of significance.

Managers who had participated in the technology monitoring program reported more frequent communication concerning innovations with supervisors, co-workers in the same department or unit, people in other units

within the company as well as individuals not employed by the company. In other words, the monitoring program had the effect of setting the "agenda" (or topic) of innovation among managers who had participated.

Participating managers also reported a higher frequency of reading technical and professional periodicals and were more familiar with the titles of such materials.

There was also more involvement by participating managers in company seminars, workshops, and department or unit meetings where technical information was presented.

In items dealing with the frequency of submission of proposals for innovation, awareness of gatekeepers to facilitate innovation, and perceived support for innovation within the company, the participating managers exceeded non-participating managers by nearly two to one.

It is important to note here that there were no individual qualifications for participation among managers interviewed. The differentiation between participation and non-participation in the technology monitoring or discovery program was arbitrarily a result of the phasing of the project within the company. We may conclude therefore that the differences between managers noted in the pilot study may be attributed to the monitoring program per se.

An early interpretation of this pilot study indicates that:

1. the quantity of dyadic communication concerning innovation was increased among those managers whose units participated in the technology monitoring incentive program
2. the demand for technical information was increased among the managers who participated

3. more proposals for innovative ideas and proposals were generated among the participants

4. gatekeepers were identified and could more easily be identified by participants

5. management was perceived to be more supportive of innovative ideas as a result of the technology monitoring incentive program.

Conclusion.

In the complete study that will be conducted, this fall, researchers will examine the following variables dealing with communication and innovative behavior:

1. Amount of communication with:
   a. immediate supervisors
   b. department co-workers
   c. co-workers outside of unit
   d. individuals outside of company

2. Index of information-seeking behavior in:
   a. reading books/articles
   b. attending workshops outside company
   c. attending workshops within company

3. Frequency of involvement in formal continuing education

4. Number and type of technical journals read

5. Awareness of gatekeepers

6. Willingness to take risks with:
   a. new products
   b. new applications
   c. procedural improvements

7. Index of interaction innovation:
   a. fair hearing of new ideas
   b. openness to new ways of doing things
   c. willingness to suggest ideas
   d. recognition for ideas
   e. utilization of ideas

8. Number of formal innovation submittals made by employees.

The idea that the flow of information, the abundance of information, and the use of information have direct and desirable effects upon innovation are well established.

We know that innovation is a very individualistic, unique, non-programmable behavior of people in all types of supportive or non-supportive organizations. After all, "necessity is the mother of invention."

But by looking at innovative people in the laboratory, the university, in government, or in industry, we have discovered that their communication capabilities, their use of information, and their flexibility to re-frame and apply ideas are critically different.

And so, the relationships between innovation and communication are potentially of great importance to managers and administrators of research and development. This research may demonstrate that the scope, frequency, and nature of communication (both formal and informal) are manageable aspects of innovation in organizations and that a technology assessment or inventory may produce temporary or long-term effects that increase innovative attitudes and behaviors among individuals and reduce individual and group resistance to change, innovation, and discovery.

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